

WHAT IS CLAIMED IS:

1. A fuel metering method for metering fuel to an engine providing bumpless transfer to backup comprising the steps of:
 - forwarding fuel flow into a common cavity;
 - 5 providing pressure relief, fuel metering and bypassing of fuel flow in said common cavity;
 - scheduling fuel flow to said engine in accordance with either a primary mode or a backup mode;
 - 10 controlling and limiting the maximum pump discharge pressure of a fuel pump;
 - maintaining a constant pressure across a metering valve by redirecting non-metered fuel flow back to a pump stage inlet; and
 - 15 using an electrical clutch to selectively determine whether the metering valve function is accomplished by said primary mode or said backup mode wherein said bumpless transfer to said backup mode is accomplished automatically.
2. The fuel metering method of claim 1 wherein fuel metering in said primary mode is controlled by an electrical signal from a full authority digital electronic control (FADEC) system.
- 20 3. The fuel metering method of claim 1 wherein transfer into said backup mode is automatic upon loss of primary power and is selectable by an electrical switch in a cockpit.
4. The fuel metering method of claim 1 wherein said backup mode operates independently from the FADEC system.
- 25 5. The fuel metering method of claim 1 wherein fuel metering in the primary mode is controlled by an electrical signal from the FADEC to a stepper motor.

6. The fuel metering method of claim 5 wherein said motor rotates a two-dimension cam.

7. The fuel metering method of claim 6 wherein said cam provides a contour that positions said metering valve using a metering valve linkage arrangement.

8. The fuel metering method of claim 6 wherein said cam provides a feedback contour for an electrical position sensor to maintain closed loop control of said stepper motor.

9. The fuel metering method of claim 6 wherein said metering valve linkage arrangement is mechanically preloaded against a contour of said cam.

10. The fuel metering method of claim 5 wherein said stepper motor has a holding torque and said holding torque retains said metering valve in a fixed position when said stepper motor is not powered.

11. The fuel metering method of claim 1 wherein transfer to said backup mode is accomplished when power is applied to a DC motor electrical clutch.

12. The fuel metering method of claim 11 wherein said DC motor is a beeper motor.

13. The fuel metering method of claim 12 wherein a transfer into said backup mode is accomplished when power is applied to an electrical clutch of said beeper motor.

14. The fuel metering method of claim 13 wherein said transfer into backup mode occurs automatically as scheduled and executed by the FADEC system or manually by said electrical switch in said cockpit.

15. The fuel metering method of claim 13 wherein said transfer initiates an action that engages a backup DC motor with the scheduling cam.

16. The fuel metering method of claim 15 wherein an electrical 5 cockpit switch sends electrical signals to said backup DC motor to rotate the cam and backdrive said stepper motor.

17. The fuel metering method of claim 16 wherein said DC motor speed and reduction gearing are selected to limit the rate of fuel flow change.

10 18. The fuel metering method of claim 17 wherein said fuel flow change is controlled to prevent engine surge or engine flameout.

19. The fuel metering method of claim 1 wherein the fuel flow discharged from said metering valve passes through a normally open overspeed/shutoff solenoid valve.

15 20. The fuel metering method of claim 19 wherein said solenoid valve terminates and bypasses metered fuel flow to a pump interstage upon receiving an electrical signal from said FADEC.

21. The fuel metering method of claim 1 wherein fuel flow exits said fuel metering device after passing through a pressuring valve.

20 22. The fuel metering method of claim 21 wherein said pressuring valve provides a drip tight seal until said solenoid valve in a shutoff mode has been opened and said fuel pump has generated a predetermined pressure.

25 23. The fuel metering method of claim 21 wherein said pressuring valve allows a bypass valve to stay in regulation at low manifold pressure when pump inlet pressures are high.

24. The fuel metering method of claim 1 wherein electrical connectors connect to said MFC.

25. The fuel metering method of claim 1 wherein at least one electrical connector is an airframe connector and said airframe connector
5 carries signals for said manual beeper motor and said electrical clutch.

26. The fuel metering method of claim 1 wherein at least one electrical connector is a FADEC connector and said FADEC connector carries signals for said primary mode stepper motor and the driver current for shutoff and manual transfer solenoids.

10 27. The fuel metering method of claim 1 wherein all electrical components are shielded under an electromagnetic interference (EMI) cover.

28. The fuel metering method of claim 27 wherein said device is upgradeable to a dual channel system.